
DATE: 16 December 2009

CONTEXT AND POLICY ISSUES:

Different assessment tools have been developed to help acquire important information on child development from birth to early childhood. Children with risk factors such as preterm infants, children with prenatal alcohol exposure, and children who were admitted to a general pediatric service may need additional developmental surveillance. A systematic review on assessment tools showed that the Modified Checklist for Autism in Toddlers (M-CHAT) provides high sensitivity and specificity for screening children under 5 years of age for autism or pervasive development delay. Information is limited about the best assessment tool and the optimal age to screen for speech and language delay in pre-school children. This report reviews the evidence regarding the effectiveness and the feasibility of universal development assessment tools for children 18 months of age.

RESEARCH QUESTIONS:

1. What is the clinical effectiveness of various universal development tools for the assessment of children 18 months of age?

2. What is the evidence to support assessing development at 18 months of age?

METHODS:

A limited literature search was conducted on key health technology assessment resources, including PubMed, the Cochrane Library (Issue 4, 2009), University of York Centre for Reviews and Dissemination (CRD) databases, ECRI, EuroScan, international health technology agencies, and a focused Internet search. The search was limited to English language articles published between 2004 and November 2009. Filters were applied to limit the retrieval to health technology assessments, systematic reviews, meta-analyses, randomized controlled trials, controlled clinical trials, observational studies, and guidelines.

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SUMMARY OF FINDINGS:

What is the clinical effectiveness of various universal development tools for the assessment of 18-month olds?

The literature did not find any health technology assessments or systematic reviews regarding the clinical effectiveness of various universal development tools for the assessment of 18-month olds. A randomized controlled trial evaluated the validity of parent-reported screening instruments for developmental delays in children 18-months of age. Children without history of developmental delay were assessed at their routine 18-month-old visit. There were 317 families randomly assigned to either the Ages and Stages Questionnaire (ASQ) or Child Development History (CDH). The accuracy of the instruments, as compared to the "gold standard" Battelle Development Inventory (a physician-assessed instrument) is reported in Table 1. The authors concluded that the accuracy of these screening instruments did not make them useful as a development screening test.

Table 1: Accuracy of Developmental Screening Tools from Rydz et al.\textsuperscript{13}

<table>
<thead>
<tr>
<th></th>
<th>Sensitivity %</th>
<th>Specificity %</th>
<th>PPV%</th>
<th>NPV%</th>
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<tbody>
<tr>
<td>ASQ</td>
<td>67</td>
<td>39</td>
<td>34</td>
<td>71</td>
</tr>
<tr>
<td>CDH</td>
<td>50</td>
<td>86</td>
<td>50</td>
<td>86</td>
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ASQ: Ages and Stages Questionnaire; CDH: Child Development History; PPV: positive predictive value; NPV: negative predictive value

A prospective study on 172 preterm infants (born at less than 31 weeks gestational age) was conducted to determine the validity of the Cognitive Adaptive Test/Clinical Linguistic and Auditory Milestone Scale (CAT/CLAMS) to detect severe cognitive-adaptive delay at 18 months. CAT/CLAMS are conducted by a physician. The Bayley Scales of Infant Development II (BSID II) was used as the reference standard. The sensitivity and specificity of CAT/CLAMS was 88% and 98%, respectively for detecting cognitive-adaptive delay. The authors concluded CAT/CLAMS are accurate tools to identify developmental delay at 18 months for preterm children.

A prospective study from Taiwan investigated the validity of the CAT/CLAMS in 808 very low birth weight infants (birth weight ≤ 1500g) followed up at 6, 12, 18, and 24 months, with the BSID II as reference standard. The units used were co-positive scores (i.e., sensitivity, or screening instrument is positive, as is the reference standard) and co-negative scores (i.e., specificity, or both the screening instrument and the reference standard are negative). For all tested age groups, CAT/CLAMS had low co-positive scores (range: 2.7% - 45.3%), despite having high co-negative scores (range: 96.7% - 100%). For 18-month old children, the co-positive score was 33.1% and the co-negative score was 100%. Because of the low sensitivity of CAT/CLAMS, the authors concluded that they are not an appropriate instrument for screening and early prediction of developmental delay in very low birth weight infants.

A prospective study tested the validity of the Taiwan Birth Cohort Study scale (TBCS) on 1267 families of 18-month old children, using BSID II as reference standard. TBCS is a parent-reported assessment tool. The children had no history of developmental delay. The sensitivity and specificity data was not reported. The study found that the developmental dimensions at 18 months of age as measured by the TBCS correlated well with the dimensions as measured by the BSID II. The authors concluded that the scale fulfills the criteria of validity as a screening tool.
instrument, with TBCS showing good correlation to BSID II in gross motor, fine motor, language, and social abilities.

What is the evidence to support assessing development at 18 months of age?

The prospective study by Vincer et al.\textsuperscript{14} investigated the optimal age to assess cognitive-adaptive delay. The authors used CAT/CLAMS to screen 172 preterm infants (less than 31 weeks gestation) at 4 months, 8 months, 12 months, and 18 months of age. The study showed that testing preterm infants at 18 months of age with CAT/CLAMS provided the highest likelihood ratios for a positive test and the lowest values for a negative test (children with developmental delay will have the highest chance to be positive and lowest chance to be negative), as shown Table 2. The authors concluded that 18 months is the optimal age to perform CAT/CLAMS in preterm infants for cognitive-adaptive delay.

Table 2: Likelihood Ratios of CAT/CLAMS from Vincer et al.\textsuperscript{14}

<table>
<thead>
<tr>
<th>CAT/CLAMS age</th>
<th>Likelihood ratio for a positive test</th>
<th>Likelihood ratio for a negative test</th>
</tr>
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<tbody>
<tr>
<td>4 months</td>
<td>1.4</td>
<td>0.3</td>
</tr>
<tr>
<td>8 months</td>
<td>4.1</td>
<td>0.3</td>
</tr>
<tr>
<td>12 months</td>
<td>30.2</td>
<td>0.4</td>
</tr>
<tr>
<td>18 months</td>
<td>35.8</td>
<td>0.1</td>
</tr>
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One randomized controlled trial\textsuperscript{13} and one cross-sectional study\textsuperscript{17} also investigated the feasibility of development tools at 18 months of age. The randomized controlled trial\textsuperscript{13} showed that parent-reported instruments such as the ASQ or CDH are feasible at 18 months, with 81% and 75% of parents correctly completing the ASQ and CDH questionnaires, respectively. The cross-sectional study assessed the feasibility of administering the Checklist for Autism in Toddlers (CHAT) for autistic disorder at the 18-month developmental assessment.\textsuperscript{17} The instrument was administered to 2117 infants with no history of developmental delay who attended the routine 18-month developmental assessment. The outcomes were then compared to clinical assessment. Following this exercise, seven children received a clinical diagnosis of autism [33.1 per 10,000 (95% CI: 13.3 - 68.0)]. The authors concluded that the instrument gave a good yield for autism diagnosis at 18 months of age.

CONCLUSIONS AND IMPLICATIONS FOR DECISION OR POLICY MAKING:

Evidence on the effectiveness and feasibility of universal development assessment tools in 18 month old children is very limited. The literature suggests that CAT/CLAMS may be useful as a developmental assessment tool for preterm children at 18 months of age. While ASQ and CDH were found to have low sensitivity and specificity, TBCS and CHAT may be valid as screening tools at 18 months of age. The literature also indicates that children 18 months of age may be an optimal age to assess cognitive-adaptive delay in preterm infants using CAT/CLAMS. Additional research is needed to develop a screening protocol that will enhance the capability for earlier detection of children with developmental delays.
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